What is claimed is:

1. A method of autocalibrating a single-photon detector arranged to detect weak photon pulses in a quantum key distribution (QKD) system, comprising:

a) performing a detector gate scan by sending a detector gate pulse to the single-photon detector and varying an arrival time T of the detector gating pulse over a first select range R1 to determine an optimal arrival time T_{MAX} that corresponds to a maximum number of photon counts N_{MAX} from the single-photon detector; and

b) performing detector gate dithering by varying the arrival time T over a second select range R2 surrounding T_{MAX} to maintain the photon count at a maximum value.

2. The method of claim 1, including:

terminating the detector gate dithering and performing another detector gate scan.

3. The method of claim 1, wherein the QKD system includes a programmable controller and a computer readable medium, and wherein the method is embodied in the computer readable medium such that the controller is capable of directing the QKD system to carry out acts a) through c).

4. The method of claim 1, wherein performing the detector gate scan includes varying a detector gate pulse width W over a range of pulse widths RW1 to establish an optimal detector gate pulse width W_{MAX}.

5. The method of claim 4, wherein performing detector gate dithering includes varying the detector gate pulse width W over a range of pulse widths RW2 < RW1 to maintain an optimal pulse width.

6. A computer-readable medium having instructions embodied therein to direct a computer in a quantum key distribution (QKD) system to perform the following method of performing autocalibration of a single-photon detector arranged to detect weak photon pulses in the QKD system:

a) performing a detector gate scan by sending a detector gate pulse to the single-photon detector and varying an arrival time T of the detector gating pulse over a first range R1 to determine an optimal arrival time T_{MAX} that corresponds to a maximum number of photon counts N_{MAX} from the single-photon detector; and

b) performing detector gate dithering by varying the arrival time T over a second select range R2 surrounding T_{MAX} to maintain the number of photon counts at a maximum value.

7. A method of exchanging a key in a quantum key distribution (QKD) system having a single-photon detector operably coupled to a controller, comprising:

sending weak photon pulses between encoding stations in the QKD system;

performing a first detector gate scan by sending a detector gate pulse from the controller to the detector over a range of detector gate pulse arrival times T to establish a first optimal arrival time T_{MAX} corresponding to a first maximum number of photon counts N_{MAX} from the detector;

terminating the first detector gate scan when the first T_{MAX} is established; and

performing a first detector gate dither altering the arrival time T over a range of arrival times R2 about the first T_{MAX} to maintain either the maximum number of photon counts N_{MAX} or a different maximum number of photon counts N'_{MAX} over the range R2.

8. The method of claim 7, wherein performing the detector gate dither results in a new optimal arrival time T'_{MAX}.

9. The method of claim 7, further including:

terminating the performing of a detector gate dither; and

performing a second detector gate scan;

terminating the second detector gate scan; and

performing a second detector gate dither.

10. The method of claim 7, further including terminating and repeating the first detector gate dither periodically so as to perform a series of detector gate dithers.

11. A computer-readable medium having instructions embodied therein to direct a computer in a quantum key distribution (QKD) system to perform the following method of performing autocalibration of a single-photon detector arranged to detect photons in the QKD system:

sending weak photon pulses between encoding stations in the QKD system;

performing a first detector gate scan by sending a detector gate pulse from the controller to the detector over a range of detector gate pulse arrival times T to establish a first optimal

arrival time T_{MAX} corresponding to a first maximum number of photon counts N_{MAX} from the detector;

terminating the first detector gate scan when the first T_{MAX} is established; and

performing a first detector gate dither by the controller altering the arrival time T over a range of arrival times R2 about the first T_{MAX} to maintain either the maximum number of photon counts N_{MAX} or a different maximum number of photon counts N'_{MAX} over the range R2.

12. A method of autocalibrating a single-photon detector in a quantum key distribution (QKD) system having a controller, comprising:

sending weak photon pulses between encoding stations in the QKD system;

performing a first detector gate scan to determine an optimum arrival time of a detector gate pulse sent from a controller to the detector;

terminating the first detector gate scan; and

periodically performing a first detector gate dither to maintain a maximum number of photon counts from the detector.

12. The method of claim 11, further including:

terminating the first detector gate dither; and

performing a second detector gate scan;

13. A method of performing photon detector autocalibration in quantum key distribution (QKD) system having a single-photon detector coupled to a controller, the method comprising:

performing a detector gate scan to establish an optimum arrival time of a detector gate pulse that corresponds with a maximum number of photon counts from a single-photon detector in the QKD system;

terminating the detector gate scan; and

performing a detector gate dither process by the arrival time of the detector gate pulse around the optimal value of the arrival time in order to provide minor adjustments to the arrival time to ensure that the detector produces a maximum number of photon counts.